

INFORMATION REPORT INFORMATION REPORT

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REPORT

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report describing the work
of the Budapest Institute for Telecommunications Research (Tavközles
Kutato Intezet - TKI) Attached to
the report are five organizational charts and two sketches of
Hungarian and Soviet radar features.

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SECRETHUNGARYSCIENTIFIC/MILITARY/AIR/ECONOMICThe BUDAPEST Institute for TelecommunicationsResearch (T.K.I.)

1. This Institute (Tavközleséi Kutató Intézet or T.K.I.) was located (at least until November 1956) at BUDAPEST II, Gabor Aron utca 65-67. It was founded in late 1950 specifically to centralize and speed up the development of technical equipment needed for the air defence of Hungary (radar, predictors and proximity fuses). Some work of this kind had been conducted since 1949 under the guidance of the Institute for War Technology (Hadi Technikai Intézet or H.T.I.) at BUDAPEST II, Erzsebet Fasar, in various factories and research institutes, and advanced sufficiently to lead to the production of the first Hungarian anti-aircraft radar in August 1950. 25X1

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4. Ministerial Subordination

T.K.I. was originally under the control of the Ministry of Medium Engineering. Later (date not established) T.K.I. was transferred to the control of the Ministry of Metallurgy, and its affairs were looked after by that Ministry's Principal Department for Telecommunications under Richard KOLOS.

5. Organisation of Technical Development Programme

The relationship between Ministries, research and development institutes, and production facilities is shown fairly clearly in Figure I. Complete knowledge of factories involved is not claimed. It will be noted that the F.M.V. (Precision Mechanics Factory) was established in 1951 at BUDAPEST XIV, Fehér ut, specifically for the manufacture of radar apparatus. After 1951 Telefonggar RT, Standard Electrical and Elektronikus Merőműszerek Gyara dropped out of the programme. Telefonggar RT produced railway signals equipment, safety devices and military equipment of which no details are available.

.../Standard

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Standard Electrical produced telephone equipment, multi-channel transmitters and receivers, and multi-channel television transmitters. Elektronikus Merőműszerek produced measuring instruments for pulse and microwave techniques, and tube measuring instruments.

6. T.K.I. - Organisation of Tasks

Figures II - V give a general view of the changing pattern of development tasks and the responsible technicians between 1951 and 1956.

7. Technical Collaboration with the U.S.S.R.

(a) In 1950 two Soviet military engineers visited H.T.I. to examine the first anti-aircraft radar of Hungarian design and manufacture. From 1951 onwards Soviet engineers and advisers were permanently attached to T.K.I. and F.M.V. 25X1

(b) In 1951 or 1952 (year uncertain) Soviet advisers made available the plans of a short range radar and two anti-aircraft radars for production at F.M.V. In 1956 a prototype and full plans of a further developed and miniaturized Soviet anti-aircraft radar was delivered to F.M.V. for study.

(c) Electrical components (chiefly resistors and potentiometers) were also manufactured to Soviet design. 25X1

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8. Technical Collaboration with the Western Satellite States

The only known instances were provided by two visits of a Czechoslovak delegation to the T.K.I. in 1954 and 1955. The only known result was a proposal to manufacture the antenna assembly of the anti-aircraft radar as an entirely separate unit, to be erected at a distance from the set.

9. Notes on Particular Programmes(a) Anti-aircraft (Artillery) Radars(i) Hungarian Mark T1

The first anti-aircraft radar of Hungarian design and manufacture (Mark T1) was completed as a prototype, mainly by Gamma in August 1950

[redacted] 25X1
[redacted] Apart
from certain [redacted] technical literature no
proper documentation was available. [redacted]

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[redacted]
The project was taken over by T.K.I. on its establishment, and by 1952 nine units had been completed by F.M.V. and were issued to the Hungarian army for training. The equipment had a wavelength of 10 cm and a range of 30 kilometres. Tracing accuracy was about ± 2.5 degrees.

(ii) Hungarian Mark T2

By the spring of 1952 an improved anti-aircraft radar had been produced by T.K.I. with the designation T2. The prototype was passed to F.M.V. for manufacture, but only one unit was made up. This was passed to H.T.I. for training in conjunction with the H.T.I. predictor, and was later

.../used

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9. (a) (ii) Cont'd

used by the Hungarian army for a time. Further work was stopped by the arrival of documentation for the production of a Soviet model. Characteristics of the T2, which was similar in design to the SCR 584, were as follows:-

Wavelength: 10 cm

Pulse rate: 1200 pps

Pulse width: 1 μ sec.

Presentation (i.e. calibration - see Figure VI):

- (a) Slant range: fine 2 km
coarse 40 km
(tracing manual)
- (b) Azimuth: fine 300 degrees (6000 degree
division of circle)
coarse 6000 degrees
- (c) Elevation: fine 300 degrees
coarse from -150 to about 1450
degrees.

Angular tracing: automatic

Angular tracing accuracy: ± 1.5 degrees

Antenna: similar to that of type SCR 584

Transmitter peak power: " " " " "

Extensive use was made in the design of this radar of technical handbooks from the Massachusetts Institute of Technology, which had just become available.

(iii) Soviet Model I

Full documentation for the production in Hungary of a Soviet anti-aircraft radar was received in 1952. [REDACTED]

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9. (a) (iii) Cont'd

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[Redacted]

[Redacted] This radar was designed to work as part of a chain with Soviet short-range radar and other artillery radar.

(iv) Soviet Model II

T.K.I. produced a prototype and full production plans of this unit early in 1956. These were passed to F.M.V. for study and production. This radar was of similar design to the early Soviet model except that the slant range tracing was automatic, and the unit had been miniaturized having a weight of about 7 tons, or about half the weight of the earlier model. Power was supplied by a diesel generator producing AC at 50 or 500 cycles/sec.

(b) Short-range Radars(1) Hungarian Model

Plans for a short-range radar of exclusively Hungarian design with provision for M.T.I. operation were completed by T.K.I. in late 1955 or early 1956 but were not proceeded with on Soviet instructions; the Soviet "advisers" stated that the equipment was unsuitable for incorporation in the Soviet radar chain. The principal characteristics of this design were as follows:-

.../Wavelength

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9. (b) (1) Cont'd

Wavelength: 10 cm in M.T.I. operation.
3 cm in normal operation.

Pulse rate: Not decided: it was hoped
that a new type of magnetron
with greater power capacity
would become available.

Presentation: Indicators: PPI scope. A scope.
Range: About 80 km. About 80 km.
Scope
Diameter: 12-15" About 5".

Design of Antenna: See Figure VII(a)

(11) Soviet Model

Plans for production of this equipment were passed
by T.K.I. to F.M.V. in 1953 or 1954. In design
this radar was similar to a model used in World War

II



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Its

principal characteristics were as follows:-

Wavelength: About 50 cm.

Pulse rate: About 400 pps "spark gap" (sic)
not known.

Calibration: Indicators: PPI scope A scope
Range: About 80 km. About 80 km.
Scope
Diameter: 12-15" ?

Antenna assembly: See Figure VII(b) for rough sketch.

It is thought that F.M.V. built between 40 and 80
sets. Some of these were used for training by the
Hungarian Army,

.../(c)

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2. (c) Early-warning Radars(i) Soviet Radars

Locations of early-warning radars in use by the Soviet occupation forces in Hungary were not known with certainty, but units are believed to have been sited in the vicinity of BUDAPEST, SZEGED, and NAGYKANIZSA. Two types of Soviet early-warning set were in use: the P20, a further development of the well-known "V-beam" radar of the second world war, using a beam with components of four different wave-lengths as a protection against active disturbances: and a second type a "hunter leading" (sic) radar also known from the second world war.

(ii) Hungarian Project

No finished set ever existed. Geza BOGNAR's work was only in the experimental stage. The Soviet authorities ordered all work to cease on early-warning radar as they had their own early warning units erected in the country. BOGNAR continued his work but only at laboratory level. Details of his work are not known [redacted]

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[redacted] the system was similar to [redacted] early-warning system, the wave-length being 10 cm and the range about 400 km.

(d) Hungarian Radar Chain

Some preliminary research was done at T.K.I. in 1956 on the project of setting-up a radar chain using equipment of Hungarian design. Plans were based at first

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9. (d) merely on a stereo system giving protection against active disturbances. Signals from several radars giving the directions of disturbances in the form of polar co-ordinates were evaluated in a memory equipment according to the coincidence principle, transformed into Cartesian co-ordinates and memorized. These memorized data were to be used for presentation on the screen of a scope and for counting machines.

(e) Work on Servo-systems for Radars

(i) The Hungarian Artillery Radar T2

The work was carried out with a synthesis method as a linear servo-system in accordance with the NYQUIST criterion. The aircraft flew with a velocity of 330 m/sec and in a parameter of 1 Km. The mean angular error for this system was 2 degrees.

(ii) P.P.I. Servo-systems

These worked with magnetic amplifiers.

Maximum angular velocity: 10 rpm.

Maximum angular error: 0.5 degree.

(f) Navigation Radar

P.M.V. was working on the development of a navigation radar for use on the Danube: the project was at a very early stage at the outbreak of the revolution.

(g) Proximity Fuses

None of these projects was adopted for series production because the necessary immunity from accidental triggering was never sufficiently attained. The favoured design was sensitive to electro-magnetic radiation from the target within a range of about 30 m. The equipment consisted of an antenna, miniature valves and an oscillator, and was dependent on the Doppler effect.

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9. (h) Microwave Techniques

- (i) A few multi-channel units were developed at T.K.I. for use in a microwave communication system. A 6 channel unit with 600 lines per channel was developed.
- (ii) The work on microwave relay stations was not finished when the revolution broke out.
- (iii) T.K.I. made a microwave signal generator operating in the Dm band.

(1) Special Tubes

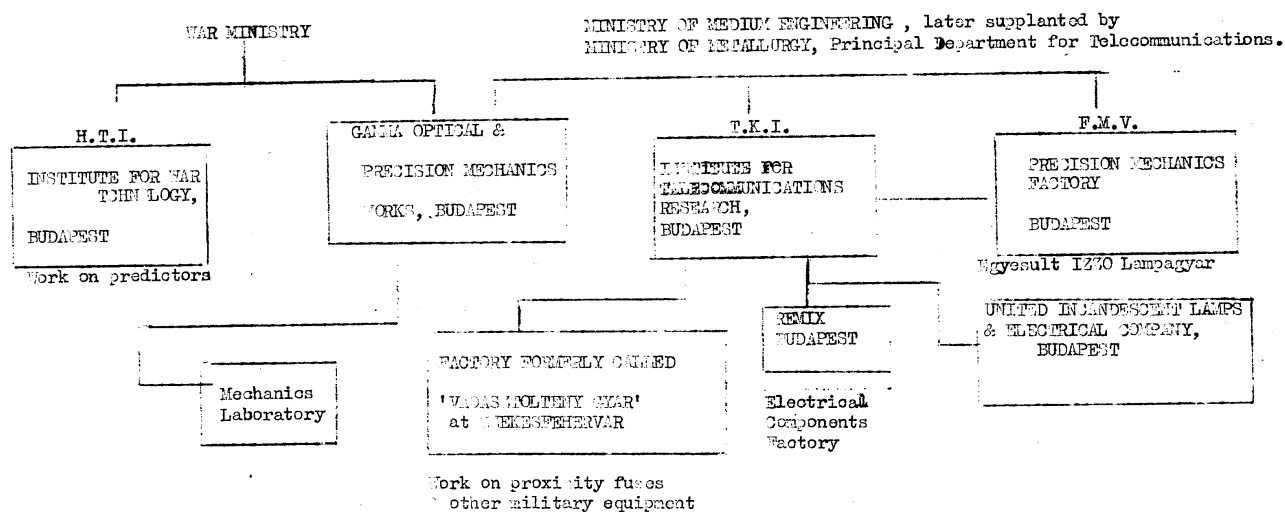
The largest cathode ray tube produced at T.K.I. was about 25 cm in diameter. A development requirement for counter tubes was placed, for the first time, in the summer of 1956. Only preliminary design work took place.

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FIGURE I

Hungarian Air Defence: Technical Development Programme

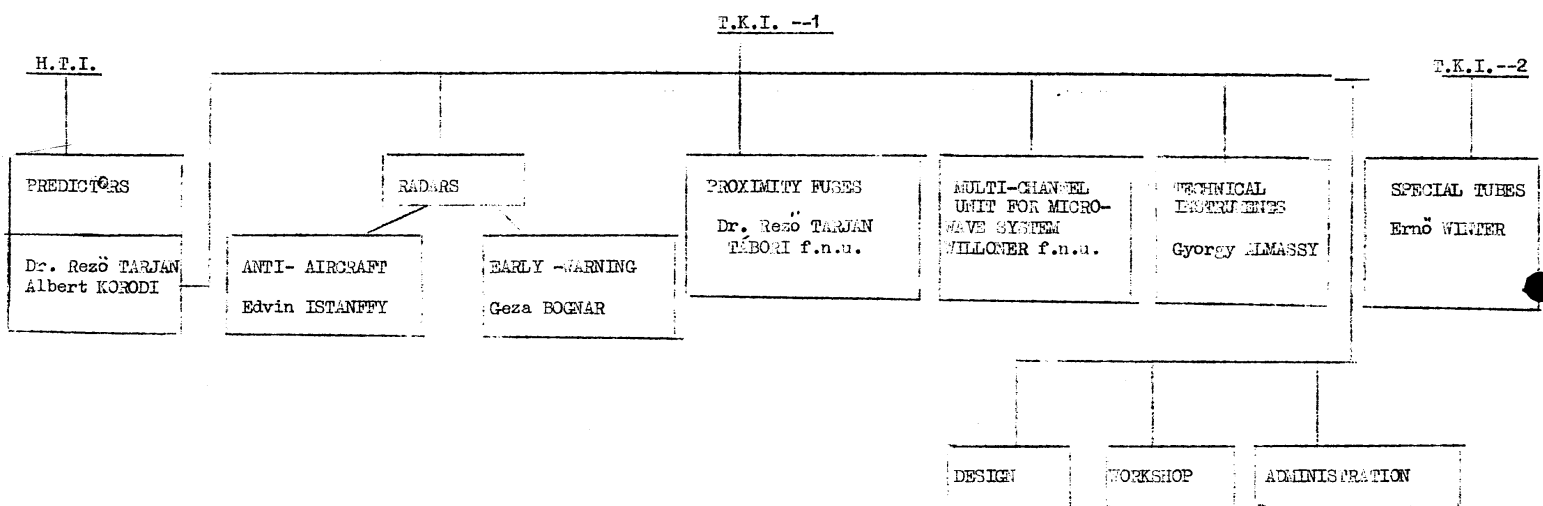
Subordination, direction and production facilities.



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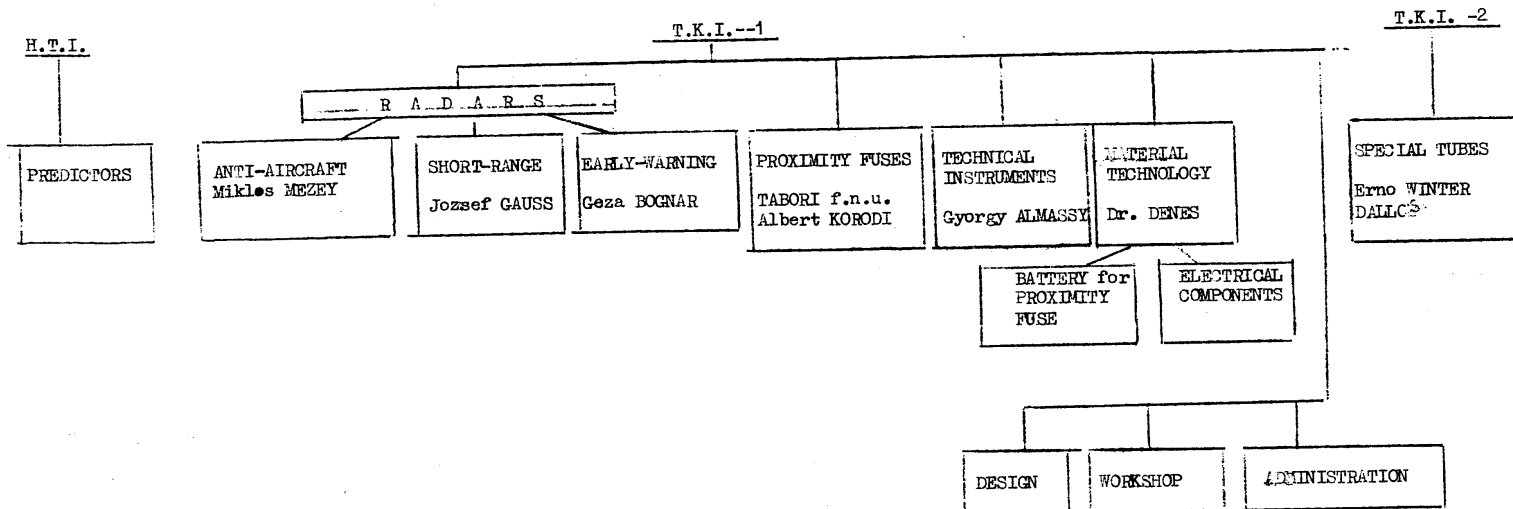
Established 1951

FIGURE II



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FIGURE III

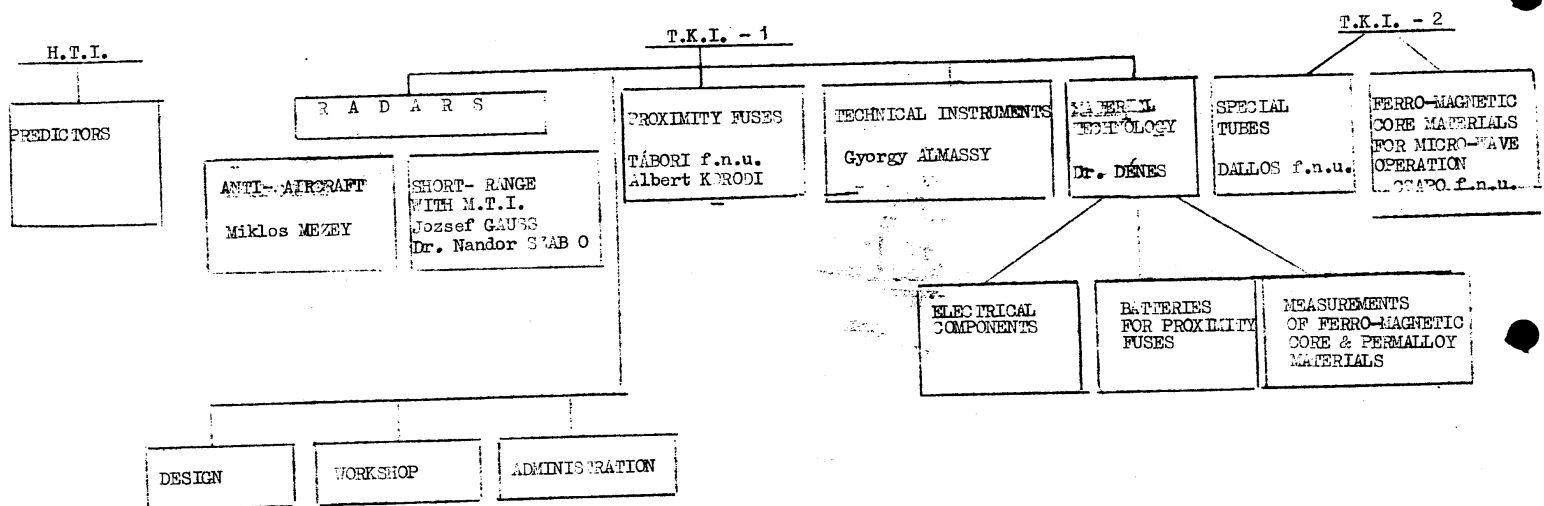


Active development work was given up
for 1½ years when plans of the Soviet
short-range and anti-aircraft radars were received.

1952 - 1954

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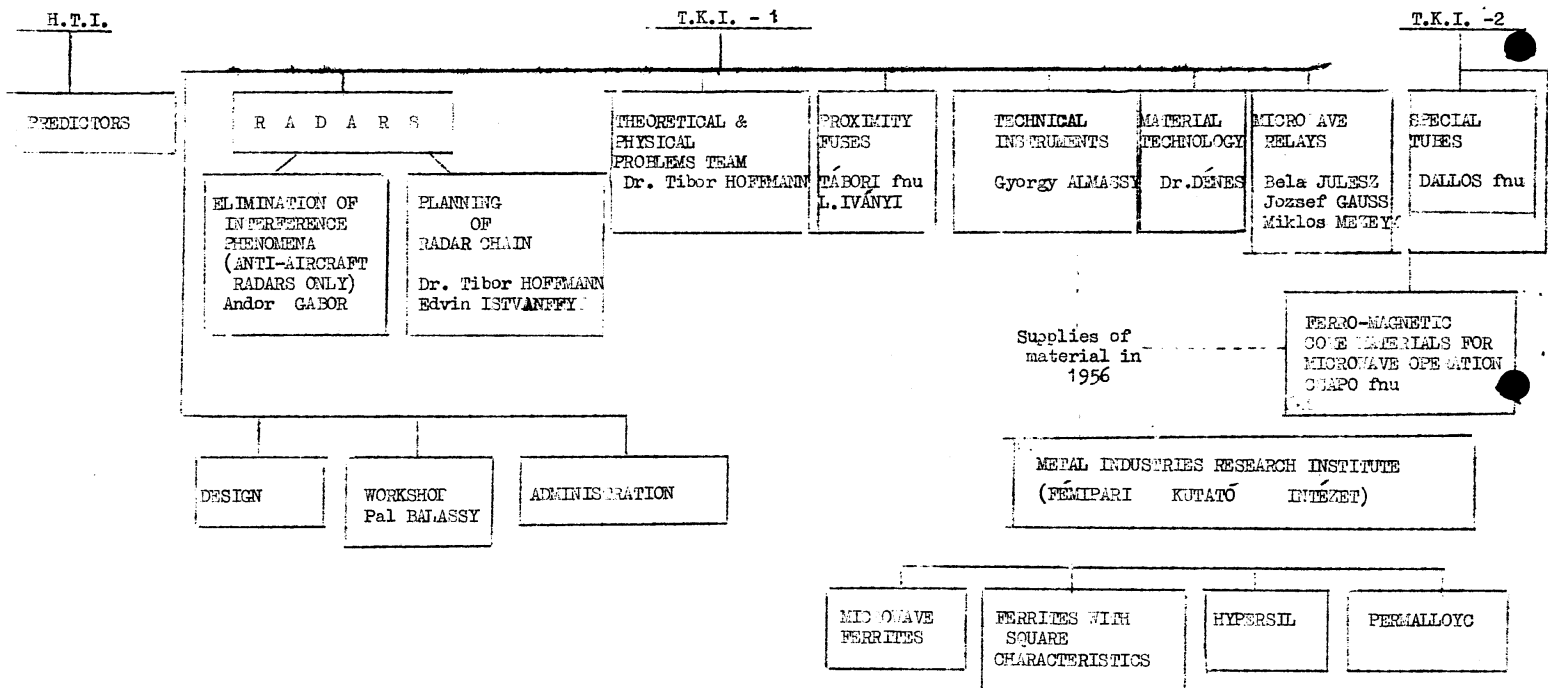
FIGURE IV



1954 - 1955

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FIGURE V

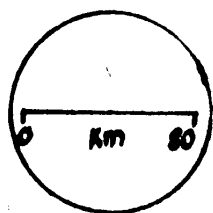


1955-1956

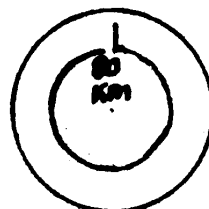
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Figure 1

Hungarian artillery radar Mk. T2 - presentation

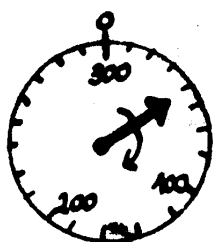


A scope



I scope

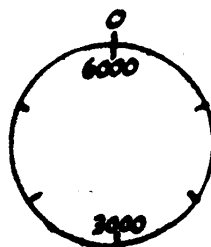
Slant range



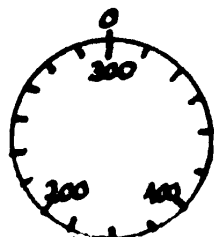
Fine

Synchro

Coarse



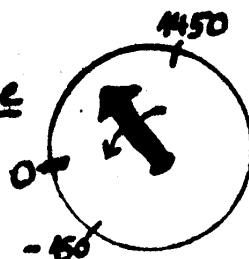
Bearing



Fine

Synchro

Coarse



Elevation

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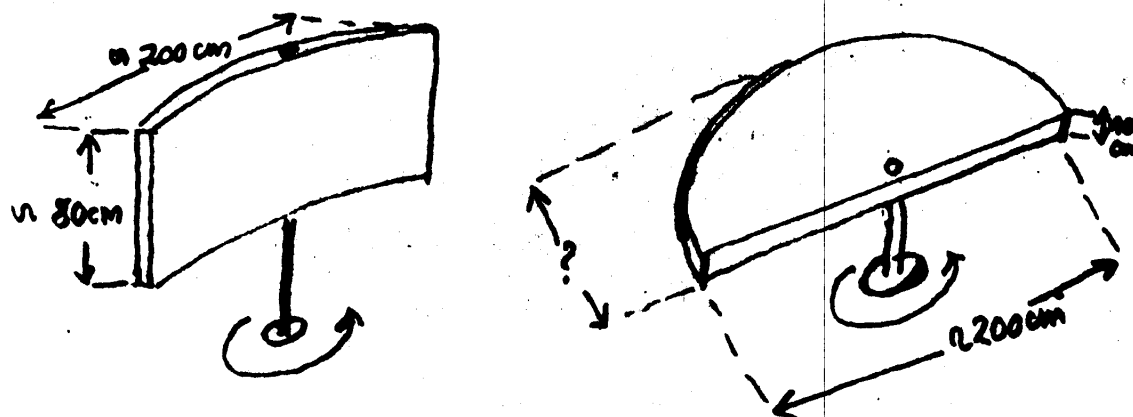
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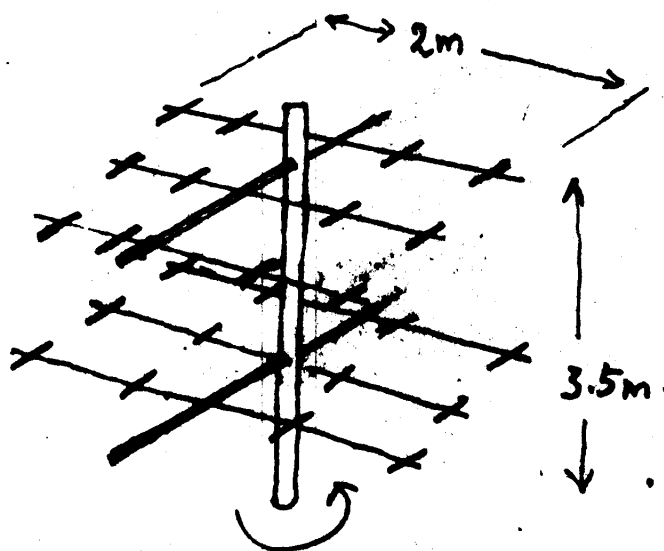
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Figure VII

(a) Hungarian short-range radar - antenna assembly.



(b) Soviet short-range radar - antenna assembly



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